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WIDE GAPS IN MORTALITY RISK: COMPARISONS AMONG RACE-SEX GROUPS ACROSS TIME AND SPACE DIMENSIONS

Effective May 1, 1980, the State Center for Health Statistics was created. Accordingly, our special-study monograph series has a new name—SCHS STUDIES replacing the former PHSB STUDIES. In the future, we hope to be more prolific than in the recent past, and as always, we welcome your suggestions for improvement. Now to the subject at hand . . .

For many conditions contributing to death, prevention is possible and chances of survival are good when cases are diagnosed and treated at an early stage. Hence, through the analysis of risk patterns among population groups, public health programs can play a major role in reducing morbidity and mortality by concentrating their efforts on those groups at greatest risk.

As discussed in a prior publication on leading causes of mortality in North Carolina (1), certain causes of death are associated with wide gaps between the sexes and between races with males and nonwhites experiencing substantially higher death rates than their female and white counterparts. In particular, the publication reveals the following recent patterns in North Carolina:

- Male death rates approach or exceed twice the female rates for 8 major causes: acute myocardial infarction, lung cancer, chronic obstructive lung diseases, motor vehicle and other accidents, cirrhosis, suicide and homicide.
- Nonwhite death rates approach or exceed twice the white rates for 6 causes: cancer of the stomach, cervix, prostate; hypertension; nephritis/nephrosis and homicide.

Differential age structures can account for mortality differences since, obviously, an older population will experience more deaths and hence higher death rates unless we adjust for age. Thus, in order to identify those race-sex groups most in need of particular kinds of service, the present effort examines age-adjusted rates for major underlying causes of death. Rates for race-sex groups within health service areas (HSA's), North Carolina and the United States for each year 1973-77 allow for trending over time (final 1978 U.S. data are not available). In addition, rates for the period 1974-78 are computed for race-sex groups at the county, HSA and state levels. Due to the high costs involved, comparable data for a prior time period have not been generated.

Consistent with procedures of the National Center for Health Statistics (2), all rates are adjusted by the direct method using ten-year age intervals and the 1940 Census of the total U.S. population as the standard. This allows for comparisons across race-sex groups, years and geographical areas. All U.S. data are final mortality statistics published annually by the National Center for Health Statistics as in reference 2.

Table 1

1977 Age-adjusted Death Rates and Percent Changes Since 1973
Race-sex Groups, United States and North Carolina

Underlying Cause	Deaths per 100,000 Population								Percent Change Since 1973*							
	White Male		White Female		Nonwhite Male		Nonwhite Female		White Male		White Female		Nonwhite Male		Nonwhite Female	
	U.S.	N.C.	U.S.	N.C.	U.S.	N.C.	U.S.	N.C.	U.S.	N.C.	U.S.	N.C.	U.S.	N.C.	U.S.	N.C.
All Causes	781.5	862.2	427.8	417.8	1045.9	1212.3	621.3	640.1	-10.6	- 9.8	-11.6	-13.6	-13.3	-11.4	-15.9	- 19.8
Heart Disease	294.0	337.3	137.2	132.1	297.8	364.3	188.7	192.9	-13.0	-11.1	-14.4	-16.2	-13.6	-10.1	-16.4	- 20.5
Hypertension	1.6	1.8	1.1	1.2	4.6	8.2	3.6	5.4	-33.3	-37.9	-26.7	-36.8	-35.2	-30.5	-39.0	- 29.9
Stroke	50.5	63.4	41.5	48.8	79.8	110.2	68.0	83.4	-23.8	-22.0	-23.9	-25.8	-25.2	-27.3	-27.5	- 33.0
Arteriosclerosis	7.2	7.5	5.5	5.4	6.4	8.8	5.1	7.6	-20.0	-19.4	-23.6	-25.0	-24.7	-23.5	-29.2	- 22.4
Cancer	160.0	159.2	108.3	97.4	205.4	212.7	122.4	114.3	+ 2.4	+ 5.7	+ 1.4	+ 3.7	+ 4.8	+ 8.9	- 1.5	- 6.8
Diabetes	9.8	10.0	9.0	9.4	16.3	16.2	22.0	24.0	-18.3	-23.1	-22.4	- 6.0	-22.7	-31.6	-23.1	- 16.1
Influenza/Pneumonia	18.1	22.0	9.8	11.0	29.6	34.9	14.0	14.9	-26.4	-20.6	-30.0	-23.1	-30.0	-26.4	-37.8	- 36.1
Chronic Obstructive Lung Disease	NA	30.8	NA	7.2	NA	17.5	NA	2.1	NA	+11.6	NA	+16.1	NA	+18.2	NA	- 56.3
Cirrhosis of Liver	16.7	15.8	7.5	6.3	31.4	31.1	15.0	16.8	-13.5	-12.2	-13.8	-24.1	- 7.4	+ 2.0	-16.7	- 28.8
Nephritis/Nephrosis	2.8	3.6	1.6	2.3	9.0	14.3	7.4	9.5	- 6.7	-10.0	-11.1	+ 9.5	-10.9	+43.0	-12.9	+ 13.1
Motor Vehicle Accidents	33.2	34.9	12.2	13.2	35.8	57.6	9.9	10.3	-13.5	-25.4	-12.9	-18.5	-25.1	-32.6	-31.3	- 52.8
Other Accidents	30.0	36.5	10.6	10.8	48.7	69.5	15.9	23.5	-14.8	-12.0	-14.5	-15.6	-17.5	- 9.9	-15.4	+ 0.4
Suicide	20.6	23.6	7.2	7.5	12.6	11.9	3.7	2.4	+10.2	- 7.8	+ 1.4	+ 5.6	+ 8.6	- 5.6	+12.1	+100.0
Homicide	8.8	11.5	2.9	3.5	60.1	46.8	12.5	12.6	+ 1.1	-18.4	+ 3.6	-18.6	-22.0	-41.4	-21.9	- 28.8

*Percent change based on rate significant to one decimal place. NA - Not available.

Age-adjusted Mortality: United States and North Carolina

Table 1 provides U.S. and N.C. rates for 1977 with corresponding percent changes since 1973. For total deaths and the five leading causes, U.S. and N.C. race-sex trends are depicted in Figures 1-6. These graphs use the logarithmic scale in order to depict the relative (as opposed to absolute) changes in death rates.

Age-adjusted Mortality: North Carolina Health Service Areas and Counties

Table 2 shows HSA total adjusted rates for 1978 and percent changes since 1973. These rates show the greatest differences among HSA's to involve excessive nonwhite mortality in the Southern Piedmont and excessive white mortality in the Cardinal. In general, there exists some tendency towards an inverse relationship between white and nonwhite mortality, e.g., the three easternmost HSA's are experiencing above-average white mortality and below-average nonwhite mortality.

Examining cause-specific mortality among the HSA's, Table 3 lists an HSA if its 1974-78 cause-race-sex-specific rate exceeded the corresponding N.C. rate by 10% or more. Single-year HSA data for the period are also available.

For counties, five-year total age-adjusted rates for race-sex groups are depicted in Figure 7 where counties are grouped according to quintile. Counties at the upper end of a range of death rates should carefully consider the present analysis and request their own cause-specific data in order to ferret out the causes of excessive mortality in one or more race-sex groups.

Table 2

1978 Age-adjusted Death Rates with Percent Changes Since 1973, Race-sex Groups

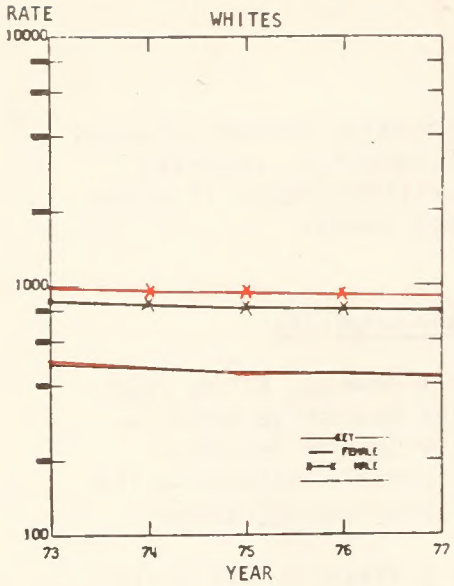
N.C. Health Service Areas

	Race and Sex							
	White Male		White Female		Nonwhite Male		Nonwhite Female	
HSA	1978	Percent Change	1978	Percent Change	1978	Percent Change	1978	Percent Change
Western	799.5	-10.6	399.5	-13.9	1135.8	-17.3	702.4	-20.3
Piedmont	814.4	-12.4	404.1	-14.2	1246.7	- 9.1	655.9	-20.4
Southern Piedmont	817.1	-10.2	400.7	-12.8	1359.7	+ 1.3	723.2	-16.7
Capital	922.6	- 5.4	432.3	- 9.4	1147.3	-13.9	549.1	-23.9
Cardinal	947.6	-12.3	457.7	-15.1	1155.4	-18.9	620.2	-25.2
Eastern	916.9	-11.4	453.7	-13.7	1192.5	-12.4	621.8	-18.3
North Carolina	850.9	-11.0	418.9	-13.4	1201.9	-12.1	631.0	-20.9

Discussion

Due to the variability often associated with small numbers, some counties—especially western counties—may have abnormally high or low rates, especially non-white rates. This is the case with high nonwhite male rates in Mitchell and Cherokee and the high nonwhite female rate in Alleghany. Otherwise, age-adjusted rates by county and cause—available for the asking—should help researchers and others to "zero in" on the particular mortality risks of race-sex groups in local areas.

The graphs below display age-adjusted death rates by race for sex groups (see key) in the U.S. and N.C. The N.C. data are shown in red; the rate is the number of deaths per 100,000 population.



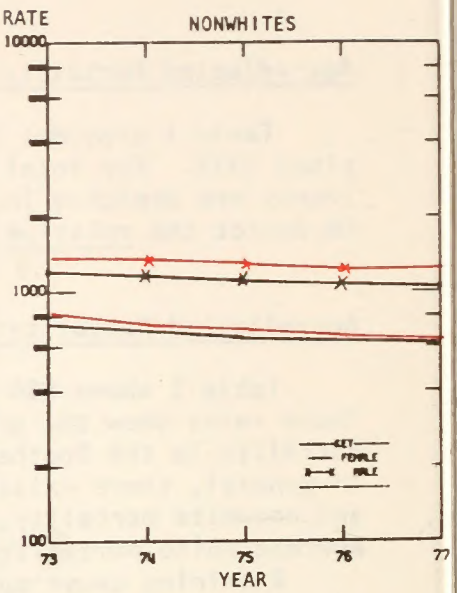
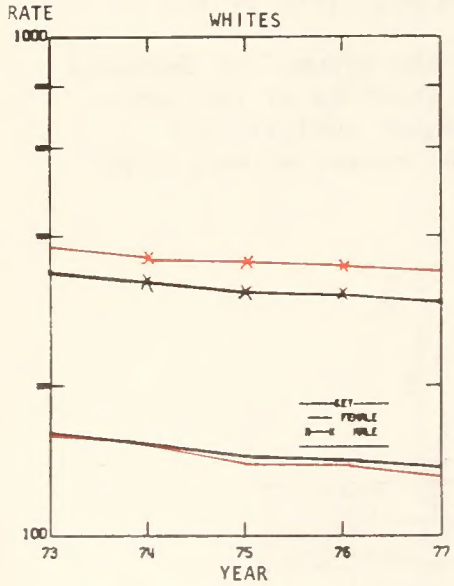


FIG. 1 TOTAL MORTALITY

Except for white females, each N.C. race-sex group exceeds its U.S. counterpart in age-adjusted mortality. N.C. females of both races have recently experienced good rate reductions but N.C. males of both races are lagging behind females as well as U.S. males.



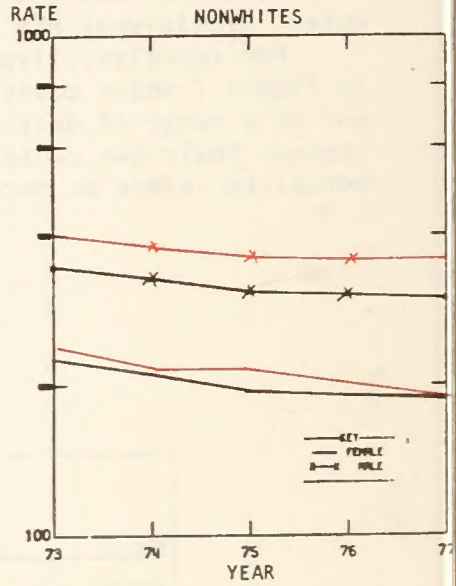
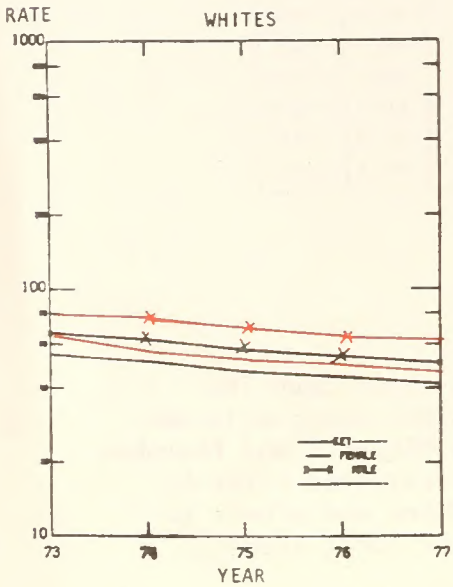


FIG. 2 HEART DISEASE MORTALITY

North Carolina males are at greater risk than are U.S. males, and reductions in male heart disease mortality have been less in North Carolina than in the U.S.



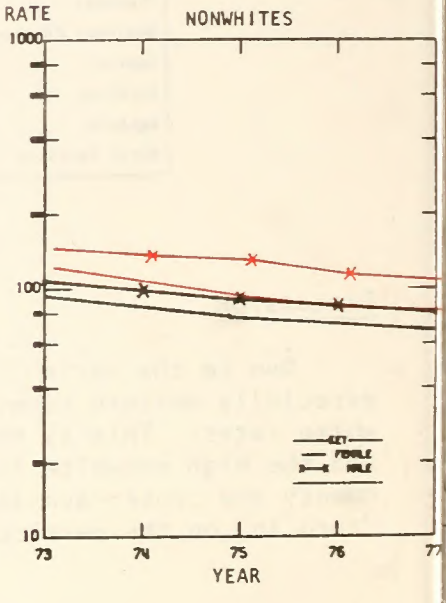


FIG. 3 STROKE MORTALITY

For all four race-sex groups, stroke mortality is substantially higher in N.C. than in the U.S. Rate reductions in the state and nation have been comparable except that N.C. nonwhite females are slightly ahead of their U.S. counterparts.

The graphs below display age-adjusted death rates by race for sex groups (see key) in the U.S. and N.C. The N.C. data are shown in red; the rate is the number of deaths per 100,000 population.

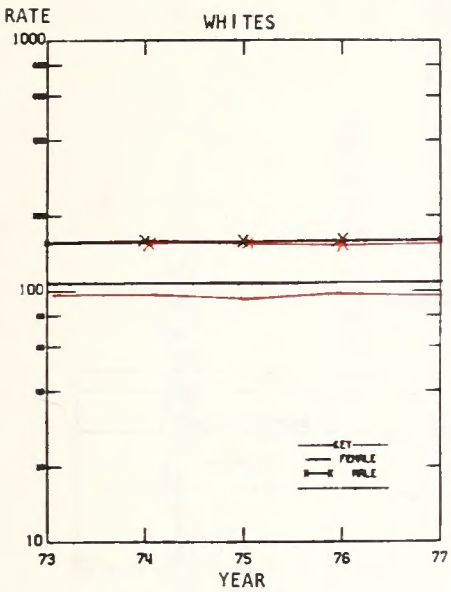
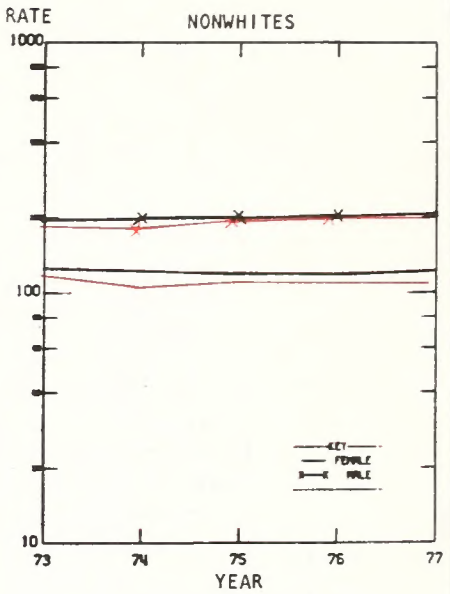


FIG. 4 CANCER MORTALITY

For all but nonwhite males, North Carolinians are at less risk of death from cancer than are other Americans. However, except for nonwhite females, total cancer mortality is rising faster in N.C. than nationwide. By site, increases involve colon/rectum, especially among nonwhite males; pancreas among females, especially nonwhites; lung, especially females; breast among white females and prostate among nonwhites.



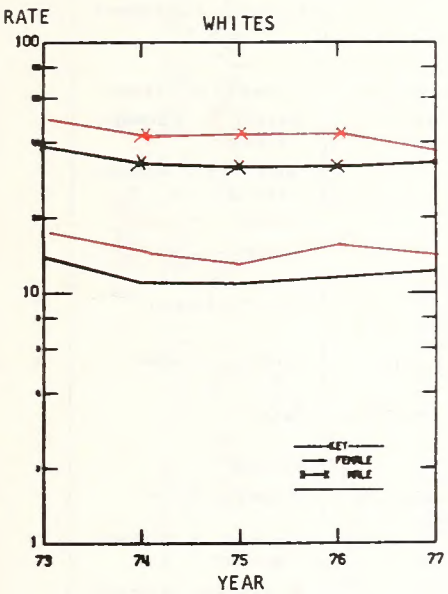
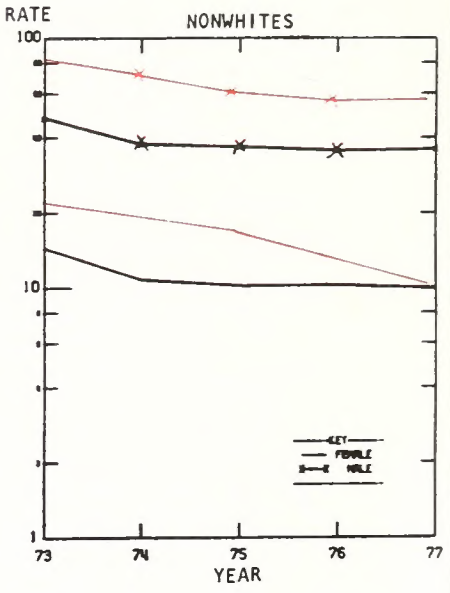


FIG. 5

MOTOR VEHICLE ACCIDENT MORTALITY

N.C. exceeds the nation with the nonwhite male rate exceeding the U.S. rate by 59%. On a positive note, however, all race-sex groups in N.C. have experienced higher declines than their U.S. counterparts. The N.C. nonwhite female rate is down by more than half.



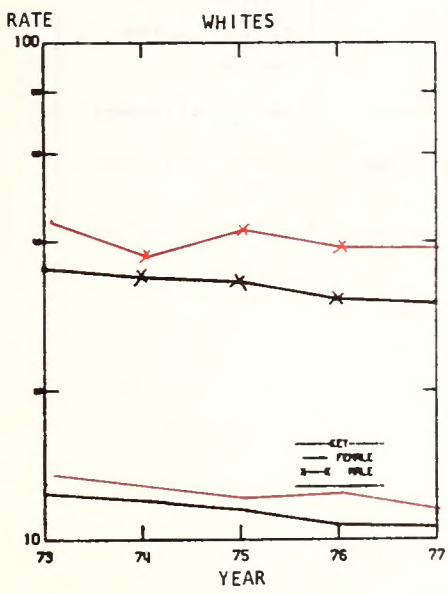


FIG. 6

NON-MOTOR-VEHICLE ACCIDENT MORTALITY

N.C.'s recent experience is disturbing. Not only do all race-sex groups, especially nonwhites, surpass their U.S. counterparts in death rates, but recent improvements have been substantially less in N.C., except for white females.

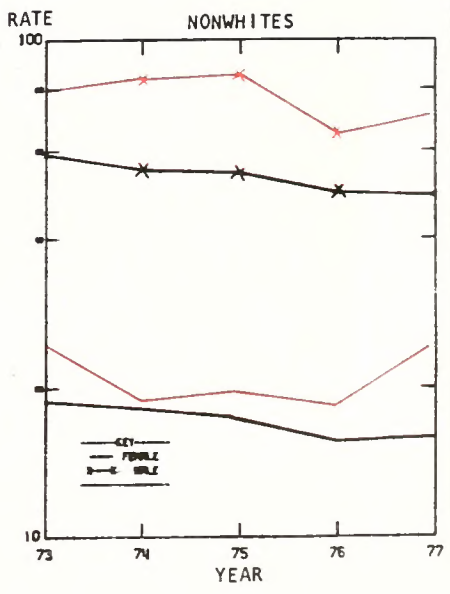


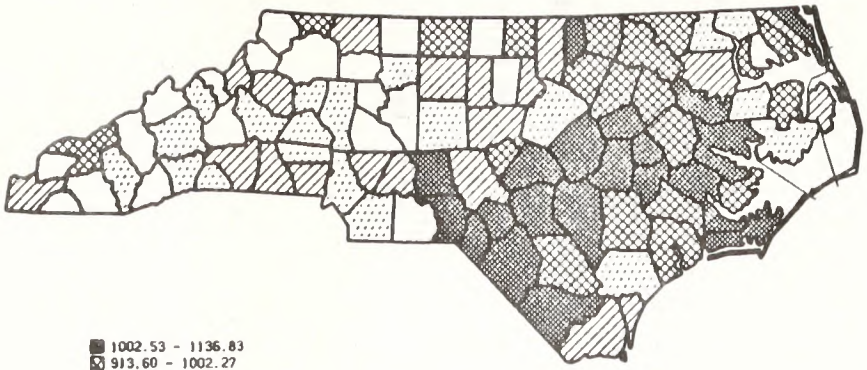
Table 3

Health Service Areas Experiencing 1974-78 Age-adjusted
Death Rates 10% or More Above Corresponding Statewide Rates

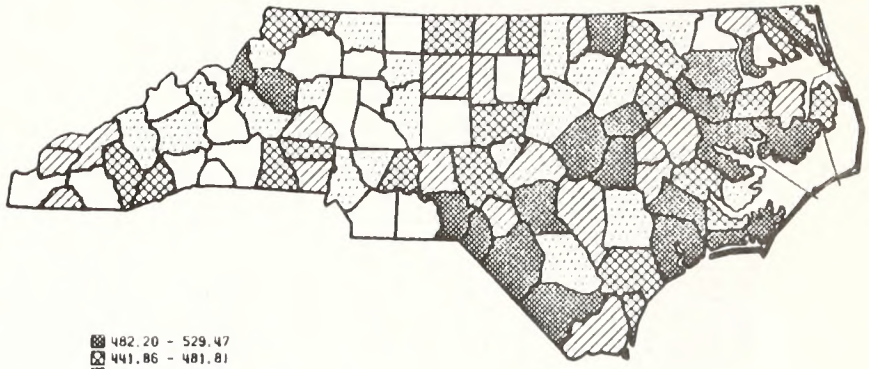
Underlying Cause	Race-sex Groups			
	White Male	White Female	Nonwhite Male	Nonwhite Female
Heart Disease	Cardinal, Eastern	Cardinal	S. Piedmont	S. Piedmont
Hypertension	Cardinal, Eastern	Cardinal, Eastern, Capital	Cardinal, Eastern	Cardinal, S. Piedmont
Stroke	Cardinal, Eastern	Cardinal	Eastern	Cardinal, Eastern
Arteriosclerosis	S. Piedmont, Cardinal	Cardinal	S. Piedmont, Cardinal	S. Piedmont, Cardinal, Western
Cancer	Eastern			Piedmont, S. Piedmont
Stomach	Western	Western, Cardinal Eastern	Western	
Colon/Rectum			Piedmont, S. Piedmont	Piedmont, S. Piedmont
Pancreas	Capital	Western	Western, S. Piedmont	Western, S. Piedmont, Piedmont
Trachea, Bronchus and Lung	Cardinal, Eastern	Eastern		Western, S. Piedmont, Capital
Female Breast		Capital		Piedmont
Cervix Uteri		Cardinal		Eastern
Ovary, Fallopian Tube and Broad Ligament		Piedmont		Western, Eastern
Prostate			Piedmont	
Leukemia	Capital	Capital, Cardinal	Capital, Piedmont	Cardinal, Piedmont, S. Piedmont
Diabetes Mellitus	Cardinal	S. Piedmont	S. Piedmont, Western, Piedmont	Cardinal
Influenza/Pneumonia	Eastern	Eastern	S. Piedmont	Western
Chronic Obstructive Lung	Cardinal	Capital	Western, Piedmont, S. Piedmont	Western, Capital
Cirrhosis of the Liver	Capital, Cardinal, Eastern	Capital, Cardinal, S. Piedmont, Eastern	S. Piedmont, Piedmont	Piedmont, S. Piedmont, Western
Nephritis/Nephrosis	S. Piedmont, Cardinal	S. Piedmont, Cardinal, Capital	S. Piedmont	S. Piedmont, Cardinal, Piedmont
Motor Vehicle Accidents	Cardinal, Eastern	Cardinal, Eastern	Cardinal	Cardinal, Eastern
Other Accidents	Western, Cardinal, Eastern			Western
Suicide	Capital	Capital	Capital, Piedmont, Eastern	Western, S. Piedmont
Homicide	Western, Cardinal	Cardinal, Eastern	Western, S. Piedmont	Western, S. Piedmont, Capital
All Causes	Cardinal, Eastern			

FIGURE 7
AGE-ADJUSTED DEATH RATES FOR RACE-SEX GROUPS
NORTH CAROLINA 1974–1978

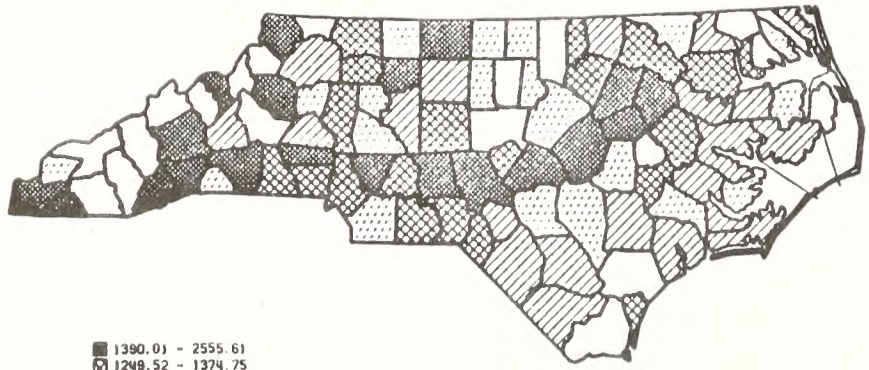
WHITE MALES



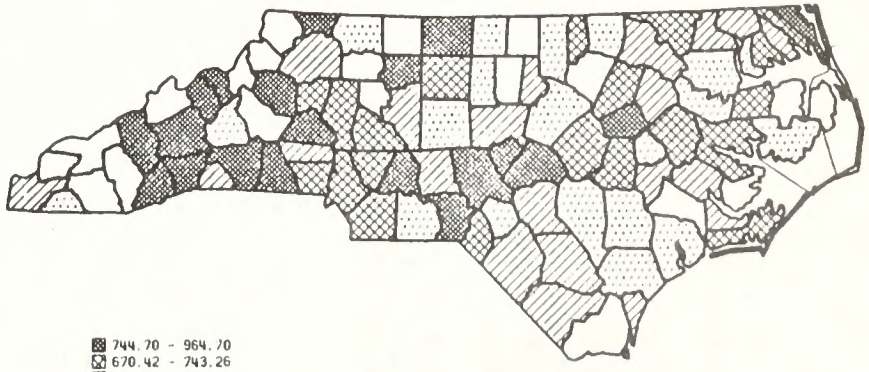
WHITE FEMALES



NONWHITE MALES



NONWHITE FEMALES



In this report, we have deliberately not shown rates for total populations (all races and sexes combined) since race and sex then become confounding factors.

This study of mortality risk has shown that, after adjustment for age, wide gaps exist between N.C. and the U.S., and within N.C., among HSA's, between the races and between the sexes. In fact, comparisons of adjusted and unadjusted rates reveal that adjustment serves to alter mortality patterns by substantial margins and in different directions in some cases. For example, whites of the Cardinal HSA and nonwhites of the Southern Piedmont have below-average unadjusted rates but above-average adjusted rates. Hence, age-adjustment is crucial to the analysis of mortality risk.

According to unpublished results of the Fall 1979 North Carolina Citizen Survey, females and nonwhites utilize health departments more than males and whites. Thus, present findings for nonwhite females should be of particular interest to public health administrators. These findings include the following:

- Between 1973 and 1977, N.C. nonwhite females experienced substantial reductions in age-adjusted mortality, leading other N.C. race-sex groups and their U.S. counterparts in reducing total mortality by 20%. By cause, the state's nonwhite females experienced higher reductions than others in heart disease, stroke, cancer, chronic obstructive lung disease, cirrhosis and motor vehicle accidents.
- At the same time, N.C.'s 1978 nonwhite female age-adjusted rate remained 50% above the white female rate with excesses in most major causes. Recent trends reveal substantial increases in lung cancer and suicide with smaller increases in pancreatic cancer and nephritis/nephrosis. And with higher rates, N.C.'s nonwhite females are lagging behind their U.S. counterparts in reducing death from hypertension, arteriosclerosis, diabetes and non-motor-vehicle accidents.

Except for a static nonwhite male rate in the Southern Piedmont, Table 2 reveals that all HSA's have shared in the recent mortality declines of all four race-sex groups, especially nonwhite females, and these declines are reducing the gaps between whites and nonwhites of both sexes. In contrast, greater downturns in female mortality have widened the gaps between N.C. males and females of both races. These trends are observed in the race and sex ratios of Table 4 where it is also shown that race differences are greater for females, sex differences are greater for whites and sex differences are greater than race differences. Based on the rates of Table 2, this is generally true in all HSA's. The 1978 race and sex ratios for HSA's also reveal that

- race differences are greater in the three westernmost HSA's;
- sex differences are highest in the Capital HSA.

The decline in mortality from stroke and heart disease in North Carolina reflects a nationwide trend. The reasons for this decline are unclear; a number of primary and secondary prevention factors have been cited including improved coronary care techniques, changes in diet and increased exercise. While there is still debate on the role factors such as these may have played, there is little disagreement that the improved detection and treatment of hypertension and reduced cigarette smoking have played important roles. In spite of these declines, cardiovascular diseases remain the leading causes of death in both North Carolina and the nation. Obviously, there remains a great deal of preventive medicine work to be done.

Table 4

Race and Sex Ratios:
Age-adjusted Mortality Rates
North Carolina, 1973 and 1978

Year	Ratio of Nonwhite to White Rates		Ratio of Male to Female Rates	
	Males	Females	Whites	Nonwhites
1973	1.43	1.65	1.98	1.71
1978	1.41	1.51	2.03	1.90

Some other comments are that (1) unadjusted rates are certainly valid and preferable indicators for allocating health manpower, facilities, supplies, etc., but in assessing mortality "risk," adjustment for confounding factors such as age is the only way to go; (2) all mortality rates are subject to spatial differences or temporal changes in certification practice and/or accuracy of diagnoses and (3) as always, the accuracy of rates examined here is also contingent upon the accuracy of population bases.

In summary, it has been demonstrated empirically that both race and sex, especially sex, are differentiating factors in mortality risk, even more so in North Carolina than nationwide, and North Carolina's sex differential is widening. The age-adjusted data also underscore the need for expanded initiatives in the area of accidents, both motor vehicle and other types.

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(1) North Carolina Department of Human Resources, Division of Health Services, Administrative Services Section, Public Health Statistics Branch. Leading Causes of Mortality, North Carolina Vital Statistics 1978, Volume 2. Raleigh, October 1979.

(2) U.S. Department of Health, Education, and Welfare, Public Health Service. Monthly Vital Statistics Report: Advance Report Final Mortality Statistics, 1977, from the National Center for Health Statistics. Vol. 28, No. 1. Hyattsville, Maryland, May 11, 1979.

Rates for this study were produced by adjustment programs developed in the State Center for Health Statistics. Available to other users, these programs use the direct method to adjust for all or any combination of age, race and sex.

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